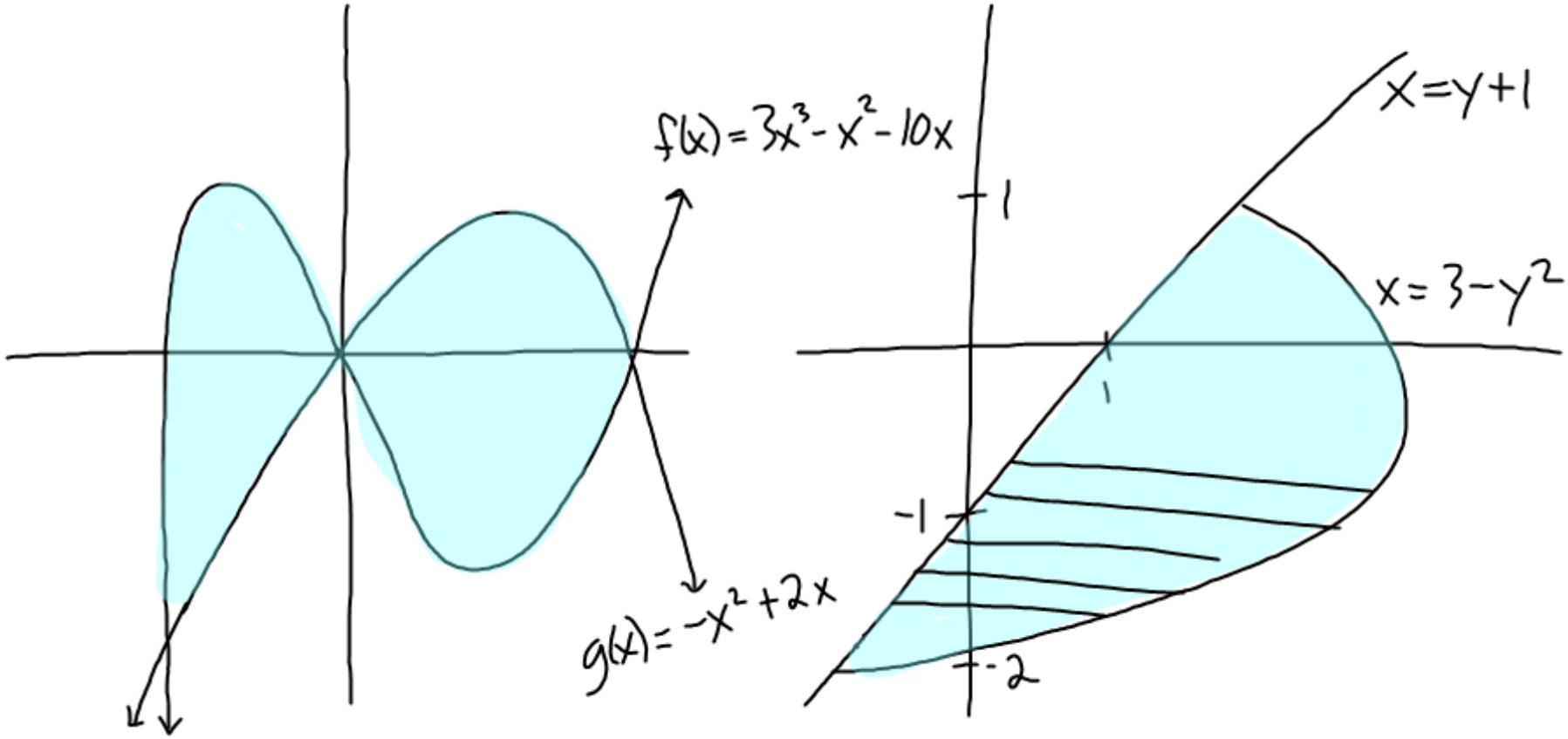
Find the Shaded Areas



$f(x) = 3x^3 - x^2 - 10x$, $g(x) = -x^2 + 2x$, intersect at $x = 0, \pm 2$

$\int f(x) = \frac{3}{4}x^4 - \frac{1}{3}x^3 - 5x^2 + C$ $\int g(x) = -\frac{1}{3}x^3 + x^2 + C$

$\int_{-2}^{0} f(x) \Rightarrow F(0) - F(-2) = 0 - -5\frac{1}{3} = 5\frac{1}{3}$

$\int_{-2}^{0} g(x) \Rightarrow G(0) - G(-2) = 0 - 6\frac{2}{3} = -6\frac{2}{3}$

$\int_{-2}^{0} g(x) - \int_{-2}^{0} f(x) = 5\frac{1}{3} - -6\frac{1}{3} = \underline{12}$

$\int_{0}^{2} f(x) = F(2) - F(0) = -10\frac{2}{3} - 0 = -10\frac{2}{3}$

$\int_{0}^{2} g(x) = G(2) - G(0) = 1\frac{1}{3} - 0 = 1\frac{1}{3}$

$\int_{0}^{2} g(x) - \int_{0}^{2} f(x) = 1\frac{1}{3} - -10\frac{2}{3} = \underline{12}$

$12 + 12 = \boxed{24 \text{ units}^2}$

2. $x = y + 1$, $x = 3 - y^2$

$y + 1 = 3 - y^2$

$y^2 + y + 1 = 3$

$y^2 + y - 2 = 0$

$(y - 1)(y + 2) = 0$

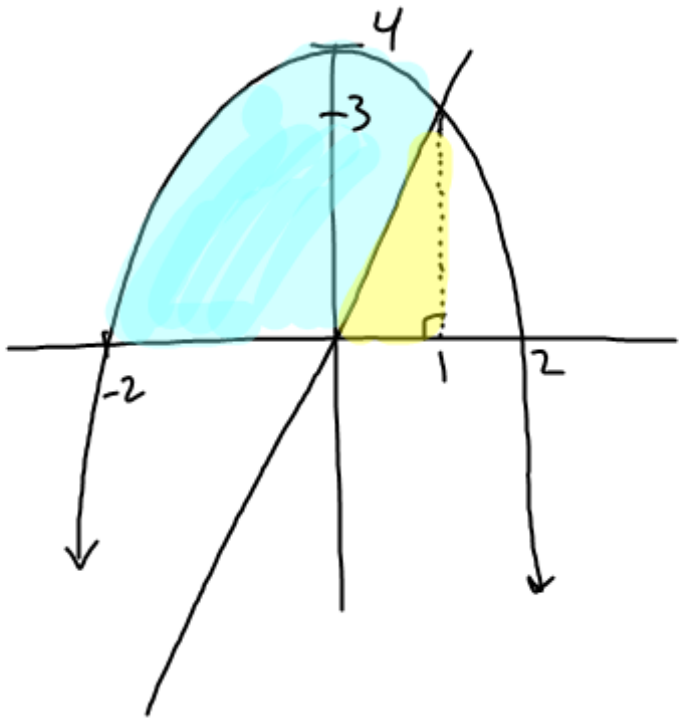
$$\int_{-2}^{1} (3 - y^2)\,dy - \int_{-2}^{1} (y + 1)\,dy$$

$$3(1) - \frac{(1)^3}{3} - \left(3(-2) - \frac{(-2)^3}{3}\right) - \left(\frac{(1)^2}{2} + (1) - \left[\frac{(-2)^2}{2} + (-2)\right]\right)$$

$$3 - \frac{1}{3} + 6 - \frac{8}{3} - \frac{1}{2} - 1 + 2 - 2$$

$$8 - 3 - \frac{1}{2} = \frac{9}{2}$$

(36)



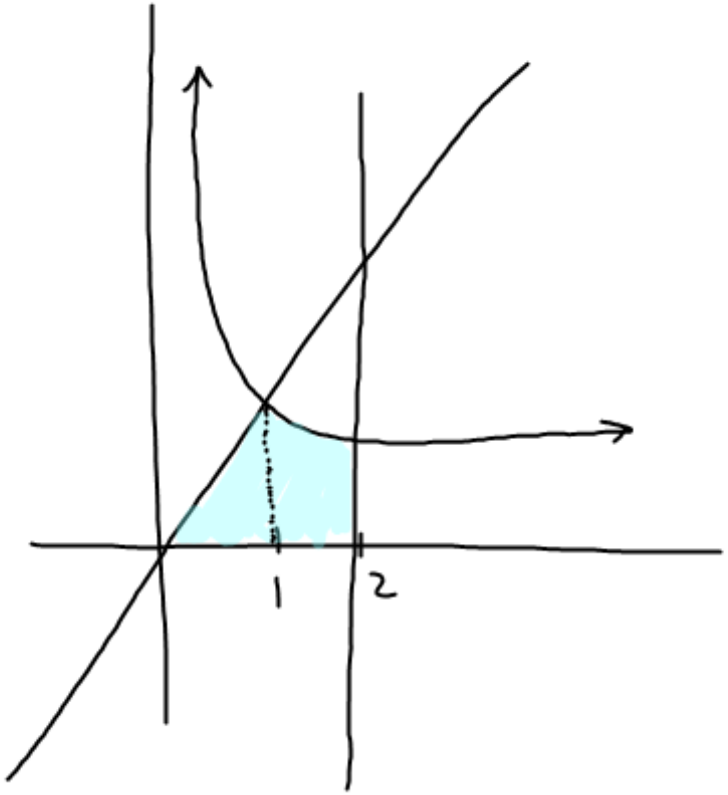
$$\int_{-2}^{1} (4 - x^2)\,dx - \underset{1.5}{\frac{1}{2}(1)(3)}$$

$$4x - \frac{x^3}{3}\Big|_{-2}^{1}$$

$$\left(4(1) - \frac{(1)^3}{3}\right) - \left(4(-2) - \frac{(-2)^3}{3}\right) - 1.5$$

$$3\tfrac{2}{3} - -5\tfrac{1}{3} = 9 - 1.5$$

$$\boxed{= 7.5}$$



$$\int_0^1 x\,dx + \int_1^2 \frac{1}{x^2}\,dx$$

$$\int_0^1 x\,dx + \int_1^2 x^{-2}\,dx$$

$$\frac{1}{2}x^2\Big|_0^1 + -\frac{1}{x}\Big|_1^2 \quad \boxed{=1}$$

7.2

#3, 4, 8–10, 15–31 (5)